Claim Listing

1–7. (cancelled)

8. (new) A method for winding a fibrous web into a web roll of a selected roll hardness distribution, comprising the steps of:

winding a fibrous web into the web roll by leading the web through a winding nip defined between said web roll and a winding drum, the web defining a first wrap angle as is passes through the nip, the wrap angle being the amount the web wraps the winding drum before entering the nip when the wrap angle is positive, or the amount the web wraps the web roll before entering the nip when the wrap angle is negative;

measuring a hardness distribution of the web roll; and

in response to the measured hardness distribution, changing the wrap angle until the selected roll hardness structure is achieved.

9. (new) The method of claim 8, wherein the web passes to the winding drum over at least one guide roll, and wherein the step of changing the wrap angle comprises the step of moving the position of the at least one guide roll with respect to the winding drum.

10. (new) The method of claim 8 wherein the wrap angle is regulated when there is slippage between the fibrous web and the winding drum.

11. (new) The method of claim 8 wherein the method is applied during the winding operation in connection with each set.

12. (new) The method of claim 8 wherein the method is used with at least one other control mode affecting the structure of the web roll, in which method the structure of the web roll being formed is controlled by regulating the tension of the web before a windup and/or by regulating winding force and/or by regulating radial nip load in nips through which the web passes.

13. (new) The method of claim 8 wherein the selected roll hardness is greater than the measured roll hardness distribution and the step of changing the wrap angle comprises making the wrap angle larger to increase the roll hardness distribution.

14. (new) The method of claim 8 wherein the step of changing the wrap angle comprises making the wrap angle smaller to provide a softer web roll.

15. (new) The method of claim 8 wherein the step of measuring the web roll hardness distribution comprises measuring the wound-on-tension in a slitter during running, and the changing of the wrap angle is controlled by a closed control loop, in response to the measured wound-on-tension.

16. (new) A method for winding a fibrous web into a web roll of a selected web hardness distribution, the web passing over at least one guide roll of an apparatus to a nip defined between the web roll and a winding drum, the position of the at least one guide roll being adjustable with respect to the winding drum to adjust the wrap angle of the web as it approaches the nip, the wrap angle being the amount the web wraps the web roll or the winding drum before reaching the nip, the method comprising the steps of:

winding a first web roll in the apparatus at a first wrap angle;

measuring the first web roll hardness distribution;

changing the magnitude of the wrap angle by changing the location of the at least one guide roll with respect to the winding drum;

winding a second web roll in the apparatus at the changed wrap angle; and

measuring the second web roll hardness distribution, and if the selected hardness distribution is present, retaining the wrap angle, and if the selected hardness distribution is not present, changing the wrap angle, and repeating the winding of web rolls, the measuring of the web roll hardness distribution, and the changing of wrap angle until the selected hardness distribution is obtained.

17. (new) The method of claim 16 wherein the step of changing the magnitude of the wrap angle comprises increasing the wrap angle.

18. (new) The method of claim 16 wherein the step of changing the magnitude of the wrap angle comprises decreasing the wrap angle.

19. (new) The method of claim 16 wherein the structure of the web roll being formed is controlled by regulating the tension of the web before a windup and/or by regulating winding force and/or by regulating radial nip load in nips through which the web passes.